Claim Rejections - 35 USC §103(a)

Claims 5 – 8 were rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 2,084,079 to Clark in view of ASM Handbooks Online.

Applicants respectfully traverse this rejection.

The rejection is improper at least because there is no evidence to establish that the ASM Handbook is available as a prior art reference against this application. To the contrary, the evidence indicates that the ASM Handbooks Online is not available as a prior art reference against this application.

MPEP 2128 states that a reference "is proven to be a 'printed publication' upon a satisfactory showing that such a document has been disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, can locate it." MPEP 2128 goes on to state that "An electronic publication, including an on-line database or Internet publication, is considered to be a "printed publication" within the meaning of 35 U.S.C. 102 (a) and (b) provided the publication was accessible to persons concerned with the art to which the document relates. Prior art disclosures on the Internet or on an on-line database are considered to be publicly available as of the date the item was publicly posted. *>Absent evidence of the date that the disclosure was publicly posted, if< the publication >itself< does not include a

publication date (or retrieval date), it cannot be relied upon as prior art under 35 U.S.C. 102(a) or (b)*>."

There is no evidence of record to establish that the ASM Handbooks Online was publicly posted before the December 23, 2002 priority date of this application. There are no markings on the ASM Handbook document itself which evidence a publication date. Applicant notes that the first page on the copy of the document provided with the Office Action has a Copyright date of 2003. A certified translation of the priority document is enclosed herewith to perfect the priority claim.

Even assuming *arguendo* that the ASM reference qualifies as prior art, proposed combination is improper since Clark actually teaches away from the claimed invention. Clark states on page 2, first column, line 74 - column 2, line 2, "The screw is thus immediately ready for use for rough purposes without any further treatment **except the customary threading** which is the same on all prior art screws." Emphasis added. This is in direct contrast to what is set forth in the application. Paragraph [0008] of the specification states:

> Through a series of experiments it has been determined that those skilled in the art were erroneous in the prior belief, based on seemingly impossible facts, and that it is actually quite possible to produce screws made from ultrahigh-strength steel using a method of cold forming according to the invention. Such screws have considerably better strength characteristics in reference to screws made by cutting due to the

best possible cross-section ratios. In the previously used production method, the wrench socket in the head could only be produced by way of predrilling and subsequently producing the contour of the wrench by way of punching. However, using the production method of cold forming, the contour of the wrench, e.g., a hexagon socket, is produced by way of a cold forming pressing process without any preliminary drilling. Therefore, the opening in the wrench socket requires considerably less depth than the same result achieved by the prior process, which includes predrilling. Therefore, the strength is considerably higher at the point of transition from screw head to shaft, because a lot more material thickness remains between the opening for the wrench socket and the exterior contour. Therefore, the weak spots that develop during cutting are avoided.

Further, Claim 5 is directed to a method for producing an indexable insert fastening screw, having an interior engaging member. The method includes providing a source material of ultra high-strength steel having a composition of 0.03% carbon, 5.0% molybdenum, 18.5% nickel, 8.5% cobalt, 0.6% titanium, 0.1% aluminum, and 77.27% iron. The method also includes cold forming the screw including the interior engaging member from the source material. Claim 8 is directed to an indexable insert fastening screw consisting of a cold-formed monolithic head and shaft, an interior engaging member disposed within the head. The screw is formed from an ultra high-strength steel having a composition of: 0.03% carbon, 5.0% molybdenum, 18.5% nickel, 8.5% cobalt, 0.6% titanium, 0.1% aluminum, and 77.27% iron.

Indexible inserts are used in high-performance cutting tools. Since high performance cutting tools operate at very high cutting speeds, the cutting tip can reach temperatures high enough to melt the material holding it to the shank. Further, the stresses transmitted by the inserts are also very high.

As set forth by the inventor in the twice previously submitted Declaration under 37 C.F.R. § 1.132, which was not indicated by the Examiner as ever having been considered, "Ultra high-strength steels are typically not cold formed in making screws, and in particular screws for indexable inserts where the strength of the screw is critical. This is due to the extremely high strength required and the fact that cold forming typically results in internal stresses and cracking when cold-forming ultra-high strength materials. Such screws typically include a machined interior tool engaging member in the head, requiring compensation in the screw design so that an appropriate high strength is achieved for this critical application."

Based on the arguments presented above, withdrawal of the § 103(a) rejection of claims 5 – 8 is respectfully requested.

Request Under 37 CFR § 1.105

A request was made by the Examiner for any information under Rule 37 CFR § 1.105 which was known to the applicant or assignee about cobalt-free and low cobalt materials. Specifically, the composition and properties of such materials. In

response, Applicants enclose a brochure of Böhler Edelstahl GmbH directed to a hot work tool steel. It is noted that the information requested by the Examiner is already of record, in particular in the cited ASM reference.

Conclusion

If the Examiner believes that any additional minor formal matters need to be addressed in order to place the present application in condition for allowance, the Examiner is invited to contact the undersigned by telephone at the Examiner's convenience.

In view of the foregoing Remarks, applicants respectfully submit that the present application, including claims 5 - 8, is in condition for allowance, and a Notice to that effect is respectfully requested.

Respectfully submitted,

Mätzler et al.

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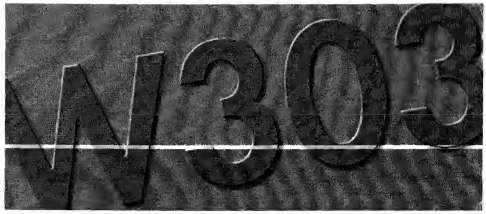
Enclosures (2)

BÖHLER



BÖHLER W303

WARMARBEITSSTAHL

HOT WORK TOOL STEEL

BÖHLER W303

Qualitativer Vergleich der wichtigsten Eigenschaftsmerkmale

Die Tabelle soll einen Anhalt für die Auswahl von Stählen bieten.
Sie kann jedoch die unterschiedlichen Beanspruchungsverhältnisse für verschiedene Einsatzgebiete nicht berücksichtigen.
Unser technischer Beratungsdienst steht Ihnen für alle Fragen der Stahlverwendung und -verarbeitung jederzeit zur Verfügung.

Qualitative comparison of the major steel properties

This table is intended to facilitate the steel choice. It does not, however, take into account the various stress conditions imposed by the different types of application.
Our technical consultancy staff will be glad to assist you in any questions concerning the use and processing of steels.

BÖHLER Marke / Grade	Warmfestigkeit High temperature strength	Warmzähigkeit High temp. toughness	Warmverschleißwiderstand High temp. wear resistance	Bearbeitbarkeit Machinability
BÖHLER W100				
BÖHLER W300 ISODISC®				
BÖHLER W300 ISOBLOC®				
BÖHLER W302 ISODISC®				
BÖHLER W302 ISOBLOC®				
BÖHLER W303 ISODISC®				
BÖHLER W303 ISOBLOC®				
BÖHLER W320 ISODISC®				
BÖHLER W321 ISODISC®				
BÖHLER W360 ISOBLOC®				
BÖHLER W400 VMR®				
BÖHLER W403 VMR®				
BÖHLER W500				
BÖHLER W705				
BÖHLER W720 VMR®	Martensitaushärtbare Stähle (Aushärtetemperatur ca. 480°C); in dieser Form nicht mit den vergütbaren Stählen vergleichbar.			
BÖHLER W722 VMR®	Maraging steels (maraging temperature about 480°C); in this form not comparable with the heat treatable steels.			
BÖHLER W750 VMR®	Aushärtbarer Stahl, in dieser Form nicht mit den vergütbaren Stählen vergleichbar. / Precipitation hardening steel; in this form not comparable with the heat treatable steels.			

Eigenschaften

Warmarbeitsstahl mit sehr guten Warmfestigkeitseigenschaften, hoher Anlassbeständigkeit und bester Zähigkeit, sowie guter Widerstandsfähigkeit gegen Brandrisse, wasserkühlbar.
BÖHLER W303 ist auch in den Sondergüten **ISODISC** und **ISOBLOC** mit verbesserter Homogenität und Festigkeit lieferbar.

Properties

Hot work tool steel featuring excellent hot tensile properties, high retention of hardness, good toughness and resistance to heat checking, admits water cooling.
BÖHLER W303 is also available in the special grades **ISODISC** and **ISOBLOC** with improved homogeneity and increased toughness.

Verwendung

Hochbeanspruchte Warmarbeitswerkzeuge, vornehmlich zur Verarbeitung von Leichtmetallegierungen, wie Pressdorne, Pressmatrizen und Blockaufnehmer für das Metallrohr- und Strangpressen, Warmfließpresswerkzeuge, Werkzeuge für die Hohlkörperfertigung, Werkzeuge für die Schrauben-, Muttern-, Nieten- und Bolzenerzeugung.
Druckgießwerkzeuge, Formteilpressgesenke, Gesenkeinsätze, Warmscherenmesser, Kunststoffformen.

Application

Heavy duty hot work tools and dies, mainly for light alloy processing: mandrels, dies, and containers for metal tube and rod extrusion; hot extrusion equipment; tools and dies for the manufacture of hollow bodies, screws, rivets, nuts and bolts.
Die casting equipment, forming dies, die inserts, hot shear blades, and plastic moulding dies.

Chemische Zusammensetzung (Anhaltswerte in %) / Chemical composition (average %)

C	Si	Mn	Cr	Mo	V
0,38	0,40	0,40	5,00	2,80	0,55

Normen

Standards

EN / DIN
< 1.2367 >
X38CrMoV5-3

BÖHLER W303

Warmformgebung

Schmieden:

1100 bis 900°C
Langsame Abkühlung im Ofen oder in wärmeisolierendem Material.

Wärmebehandlung

Weichglühen:

750 bis 800°C
Geregelte langsame Ofenabkühlung mit 10 bis 20°C/h bis ca. 600°C,
weitere Abkühlung in Luft.
Härte nach dem Weichglühen: **max. 205 HB.**

Spannungsarmglühen:

600 bis 650°C
Langsame Ofenabkühlung.
Zum Spannungsabbau nach umfangreicher Zerspanung oder bei Komplizierten Werkzeugen.
Haltedauer nach vollständiger Durchwärmung 1 - 2 Stunden in neutraler Atmosphäre.

Härten:

1030 bis 1080°C
Öl, Warmbad (500 - 550°C),
Luft, Vakuum
Haltedauer nach vollständigem Durchwärmen:
15 bis 30 Minuten.
Erzielbare Härte:
52 - 56 HRC bei Öl- oder Warmbadhärtung;
50 - 54 HRC bei Luft- oder Vakuumhärtung.

Anlassen:

Langsames Erwärmen auf Anlasstemperatur unmittelbar nach dem Härten / Verweildauer im Ofen 1 Stunde je 20 mm Werkstückdicke, jedoch mindestens 2 Stunden/Luftabkühlung.
Es wird empfohlen mindestens zweimal anzulassen.
Ein 3. Anlassen zum Entspannen ist vorteilhaft.
1. Anlassen ca. 30°C oberhalb des Sekundärhärtemaximums.
2. Anlassen auf Arbeitshärte.
Richtwerte für die erreichbare Härte nach dem Anlassen bitten wir dem Anlassschaubild zu entnehmen.
3. Anlassen zum Entspannen 30 bis 50°C unter der höchsten Anlasstemperatur.

Hot forming

Forging:

1100 to 900°C (2012 to 1652°F)
Slow cooling in furnace or thermoinsulating material.

Heat treatment

Annealing:

750 to 800°C (1382 to 1472°F)
Slow controlled cooling in furnace at a rate of 10 to 20°C/hr (50 to 68°F/hr) down to approx. 600°C (1112°F), further cooling in air.
Hardness after annealing: **max. 205 HB.**

Stress relieving:

600 to 650°C (1112 to 1202°F)
Slow cooling in furnace; intended to relieve stresses set up by extensive machining, or in complex shapes.
After through heating, hold in neutral atmosphere for 1 - 2 hours.

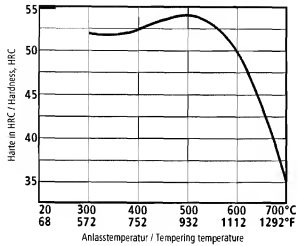
Hardening:

1030 to 1080°C (1886 to 1976°F)
Oil, salt bath (500 - 550°C / 932-1022°F),
air, vacuum
Holding time after temperature equalization:
15 to 30 minutes.
Obtainable hardness:
52 - 56 HRC in oil or salt bath,
50 - 54 HRC in air or vacuum

Tempering:

Slow heating to tempering temperature immediately after hardening / time in furnace 1 hour for each 20 mm of workpiece thickness but at least 2 hours / cooling in air. It is recommended to temper at least twice.
A third tempering cycle for the purpose of stress relieving may be advantageous
1st tempering approx. 30°C (86°F) above maximum secondary hardness.
2nd tempering to desired working hardness.
The tempering chart shows average tempered hardness values.
3rd for stress relieving at a temperature 30 to 50°C (86 to 122°F) below highest tempering temperature.

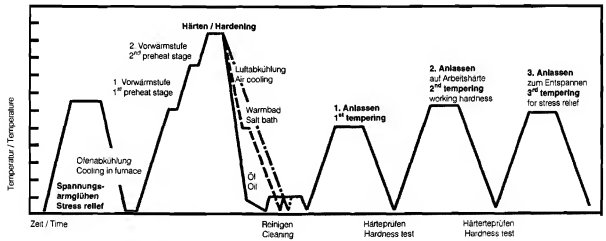
Anlassschaubild **Tempering chart**



Härtetemperatur: 1050°C
Probenquerschnitt: Vkt. 50 mm

Hardening temperature: 1050°C (1922°F)
Specimen size: square 50 mm

Wärmebehandlungsschema **Heat treatment sequence**



Oberflächenbehandlung

Nitrieren:

Für Bad- und Gasnitrierung geeignet.

Surface treatment

Nitriding:

Suited for both bath and gas nitriding.

Reparaturschweißen

Die Gefahr von Rissen bei Schweißarbeiten ist, wie allgemein bei Werkzeugstählen, vorhanden.
Sollte ein Schweißen unbedingt erforderlich sein, bitten wir Sie, die Richtlinien Ihres Schweißzusatzwerkstoffherstellers zu beachten.

Repair welding

There is a general tendency for tool steels to develop cracks after welding.
If welding cannot be avoided, the instructions of the appropriate welding electrode manufacturer should be sought and followed.

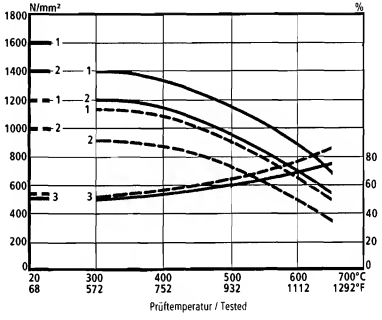
BÖHLER W303

Warmfestigkeitsschaubild

—— vergütet 1600 N/mm²
- - - - vergütet 1200 N/mm²
1.... Zugfestigkeit N/mm²
2.... 0,2-Grenze N/mm²
3.... Einschnürung %

Hot strength chart

—— heat treated 1600 N/mm²
- - - - heat treated 1200 N/mm²
1..... Tensile strength N/mm²
2..... 0.2% proof stress N/mm²
3..... Reduction of area %

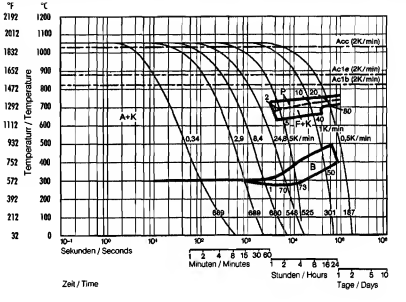


ZTU-Schaubild
für kontinuierliche Abkühlung /
Continuous cooling CCT curves

Chemische Zusammensetzung (Anhaltswerte in %) / Chemical composition (average %)						
C	Si	Mn	Cr	Mo	V	W
0,39	0,34	0,27	5,00	3,11	0,64	0,24

Austenitisierungstemperatur: 1050°C
Haltedauer: 15 Minuten

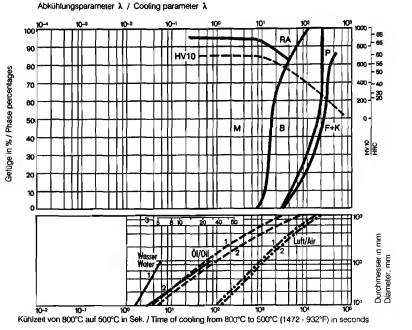
689 - 187 Härte in HV
1 . . . 80 Gefügeanteile in %
0,34 . . . 24,8 Abkühlungsparameter, d. h. Abkühlungsdauer von 800 - 500°C in s x 10^{-2}
5 ... 0,5K/min Abkühlungsgeschwincigkeit in K/min im Bereich 800 - 500°C



Austenitising temperature: 1050°C (1922°F)
Holding time: 15 minutes

689 - 187 Vickers harcness
1 . . . 80 phase percentages
0.34 . . . 24.8 cooling parameter, i.e. duration of cooling from 800 - 500°C (1472-932°F) in s x 10^{-2}
5 .... 0.5 K/min cooling rate in K/min in the 800 - 500°C (1472-932°F) range

Gefügemengenschaubild /
Quantitative phase diagram



A..... Austenit / Austenite
B..... Bainit / Bainite
F..... Ferrit / Ferrite
K..... Karbid / Carbide
M..... Martensit / Martensite
P..... Perlit / Perlite
RA..... Restaustenit / Retained austenite

1..... Werkstückrand / Edge or face
2..... Werkstückzentrum / Core
3..... Jominy Probe:
Abstand von der Stirnfläche
3..... Jominy test:
distance from end

BÖHLER W303

Bearbeitungshinweise (Wärmebehandlungszustand weichgeglüht, Richtwerte)

Drehen mit Hartmetall				
Schnittiefe mm	0,5 bis 1	1 bis 4	4 bis 8	über 8
Vorschub mm/U	0,1 bis 0,3	0,2 bis 0,4	0,3 bis 0,6	0,5 bis 1,5
BÖHLERIT- Hartmetallsorte	SB10,SB20	SB10,SB20,SB30	SB30,EB20	SB30,SB40
ISO - Sorte	P10,P20	P10,P20,P30	P30,M20	P30,P40
		Schnittgeschwindigkeit, m/min		
Wendeschneidplatten Standzeit 15 min	310 bis 200	220 bis 130	180 bis 100	120 bis 50
Gelötete Hartmetallwerkzeuge Standzeit 30 min	260 bis 150	210 bis 100	130 bis 85	90 bis 50
Beschichtete Wendeschneidplatten Standzeit 15 min BÖHLERIT ROYAL 121 BÖHLERIT ROYAL 131	 bis 300 bis 240	 bis 270 bis 175	 bis 195 bis 135	 bis 125 bis 70
Schneidwinkel für gelötete Hartmetallwerkzeuge Spanwinkel Freiwinkel Neigungswinkel	 12° 6 bis 8° 0°	 12° 6 bis 8° - 4°	 12° 6 bis 8° - 4°	 12° 6 bis 8° - 4°

Drehen mit Schnellarbeitsstahl					
Schnittiefe mm	0,5	3	6	10	über 10
Vorschub mm/U	0,1	0,5	1,0	1,5	über 1,5
BÖHLER/DIN-Sorte	S700 / DIN S10-4-3-10				
	Schnittgeschwindigkeit, m/min				
Standzeit 60 min	45 bis 30	30 bis 22	22 bis 18	18 bis 12	16 bis 8
Spanwinkel	14°	14°	14°	14°	14°
Freiwinkel	8°	8°	8°	8°	8°
Neigungswinkel	0°	0°	-4°	-4°	-4°

Fräsen mit Messerköpfen		
Vorschub mm/U	bis 0,2	0,2 bis 0,4
	Schnittgeschwindigkeit, m/min	
BÖHLERIT SBF/ ISO P25	150 bis 100	110 bis 60
BÖHLERIT SB40/ ISO P40	100 bis 60	70 bis 40
BÖHLERIT ROYAL 131 / ISO P35	130 bis 85	- -

Bohren mit Hartmetall			
Bohrerdurchmesser mm	3 bis 8	8 bis 20	20 bis 40
Vorschub mm/U	0,02 bis 0,05	0,05 bis 0,12	0,12 bis 0,18
BÖHLERIT / ISO-Hartmetallsorte	HB10/K10	HB10/K10	HB10/K10
	Schnittgeschwindigkeit, m/min		
	50 bis 35	50 bis 35	50 bis 35
Spitzenwinkel	115 bis 120°	115 bis 120°	115 bis 120°
Freiwinkel	5°	5°	5°

Recommendation for machining

(Condition annealed, average values)

Turning with carbide tipped tools

depth of cut mm	0,5 to 1	1 to 4	4 to 8	over 8
feed, mm/rev.	0,1 to 0,3	0,2 to 0,4	0,3 to 0,6	0,5 to 1,5
BÖHLERIT grade	SB10,SB20	SB10,SB20,SB30	SB30,EB20	SB30,SB40
ISO grade	P10,P20	P10,P20,P30	P30,M20	P30,P40
	cutting speed, m/min			
indexable carbide inserts edge life 15 min	310 to 200	220 to 130	180 to 100	120 to 50
brazed carbide tipped tools edge life 30 min	260 to 150	210 to 100	130 to 85	90 to 50
hardfaced indexable carbide inserts edge life 15 min				
BÖHLERIT ROYAL 121	to 300	to 270	to 195	to 125
BÖHLERIT ROYAL 131	to 240	to 175	to 135	to 70
cutting angles for brazed carbide tipped tools				
rake angle	12°	12°	12°	12°
clearance angle	6 to 8°	6 to 8°	6 to 8°	6 to 8°
angle of inclination	0°	- 4°	- 4°	- 4°

Turning with HSS tools

depth of cut, mm	0,5	3	6	10	over 10
feed, mm/rev.	0,1	0,5	1,0	1,5	over 1,5
HSS-grade BÖHLER/DIN	S700 / DIN S10-4-3-10				
	cutting speed, m/min				
edge life 60 min	45 to 30	30 to 22	22 to 18	18 to 12	16 to 8
rake angle	14°	14°	14°	14°	14°
clearance angle	8°	8°	8°	8°	8°
angle of inclination	0°	0°	-4°	-4°	-4°

Milling with carbide tipped cutters

feed, mm/tooth	to 0,2	0,2 to 0,4
	cutting speed, m/min	
BÖHLERIT SBF/ ISO P25	150 to 100	110 to 60
BÖHLERIT SB40/ ISO P40	100 to 60	70 to 40
BÖHLERIT ROYAL 131 / ISO P35	130 to 85	

Drilling with carbide tipped tools

drill diameter, mm	3 to 8	8 to 20	20 to 40
feed, mm/rev.	0,02 to 0,05	0,05 to 0,12	0,12 to 0,18
BÖHLERIT / ISO-grade	HB10/K10	HB10/K10	HB10/K10
	cutting speed, m/min		
	50 to 35	50 to 35	50 to 35
top angle	115 to 120°	115 to 120°	115 to 120°
clearance angle	5°	5°	5°

BÖHLER W303

Physikalische Eigenschaften **Physical properties**

Dichte bei / Density at ..... 20°C (68°F) ..... 7,85 ..... kg/dm³
500°C (932°F) ..... 7,69 ..... kg/dm³
600°C (1112°F) ..... 7,65 ..... kg/dm³

Spezifische Wärme bei / Specific heat at ..... 20°C (68°F) ..... 460 ..... J/(kg.K)
500°C (932°F) ..... 550 ..... J/(kg.K)
600°C (1112°F) ..... 590 ..... J/(kg.K)

Spez. elektr. Widerstand bei / Electrical resistivity at ..... 20°C (68°F) ..... 0,50 ..... Ohm.mm²/m
500°C (932°F) ..... 0,84 ..... Ohm.mm²/m
600°C (1112°F) ..... 0,94 ..... Ohm.mm²/m

Elastizitätsmodul bei / Modulus of elasticity at ..... 20°C (68°F) ..... 215 x 10³ .. N/mm²
500°C (932°F) ..... 176 x 10³ .. N/mm²
600°C (1112°F) ..... 165 x 10³ .. N/mm²

Wärmeausdehnung zwischen 20°C und ...°C, 10^{-6} m/(m.K) bei
Thermal expansion between 20°C (68°F) and ...°C (°F), 10^{-6} m/(m.K) at

100°C 212°F	200°C 392°F	300°C 572°F	400°C 752°F	500°C 932°F	600°C 1112°F	700°C 1292°F
11,5	12,0	12,2	12,5	12,9	13,0	13,2

Wärmeleitfähigkeit bei °C, W/(m.K)
Thermal conductivity at °C (°F), W/(m.K)

Zustand / Condition	Temperatur/Temperature 100°C 212°F	200°C 392°F	300°C 572°F	400°C 752°F	500°C 932°F	600°C 1112°F	700°C 1292°F
vergütet hardened and tempered	29,0	30,4	31,1	31,1	30,4	29,2	28,8

Für Anwendungen und Verarbeitungsschritte, die in der Produktbeschreibung nicht ausdrücklich erwähnt sind, ist in jedem Einzelfall Rücksprache zu halten.

As regards applications and processing steps that are not expressly mentioned in this product description/data sheet, the customer shall in each individual case be required to consult us.

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